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Effects of shale gas development on water quality: experiences from the Marcellus Shale

The impact of shale gas development on surface water quality has been explored in a recent study. Focusing on the Pennsylvania portion of the Marcellus Shale formation (which stretches from West Virginia to the Canadian border), the researchers conclude that shale gas wells and the treatment of shale gas extraction waste have measurable impacts on downstream surface water quality.

The researchers collected data from over 20,000 water quality observations, between 2000 and 2011, and mapped them. These were then considered in relation to the location of shale gas wells and information about shale gas waste shipments, using a geographical information system (GIS). This allowed them to make links between areas of shale gas development and downstream water quality, using a sophisticated statistical model that accounted for other factors that might be affecting water quality.

The study revealed that downstream concentrations of chloride increased when there were more wastewater plants treating and releasing shale gas waste in an area. High levels of chloride can damage aquatic ecosystems, and also trigger the release of other pollutants, such as heavy metals and phosphates, from sediment. The number of wells themselves did not seem to affect chloride levels.

On the other hand, there was no increase in suspended solids downstream of wastewater plants treating shale gas waste, but there was an increase of this pollutant downstream of wells. Suspended solids include silt, decaying organic matter and industrial waste, which can also cause ecological problems by clouding water, reducing sunlight, raising water temperature and reducing oxygen levels. They can also block pipes, leading to financial costs for downstream water users.

Based on the results, the researchers calculated that for each additional 1.5 facilities treating waste upstream, the downstream water concentrations of chloride increase by 10-11%. For an additional 18 well pads, they calculated that the downstream suspended solids increase by 5%.

The researchers stress that their geographical mapping method only models average impacts at a large scale, rather than at a precise, local scale. It is also focused on surface water rather than groundwater, and does not consider other forms of contamination directly from wells or shale deposits.

However, they say the results could help inform policy decisions about protecting water quality near shale gas development and waste treatment sites, as well as decisions regarding well location, waste disposal, erosion control and contaminant monitoring. To further inform policy, a better understanding is also needed of the costs associated with the increased pollution, and of how they compare to the economic benefits of shale gas development.

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Contact: olmstead@rff.org

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